CHARLES RIVER WATERSHED STUDY

Summary of the Fourth Meeting of the Coordinating Committee for the Charles River Watershed Study at Waltham, Mass.

15 February 1968

Prepared by

Department of the Army

New England Division, Corps of Engineers

424 Trapelo Road, Waltham, Mass.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

SUMMARY OF THE FOURTH MEETING OF THE COORDINATING COMMITTEE FOR THE CHARLES RIVER WATERSHED STUDY AT WALTHAM, MASS. 15 FEBRUARY 1968

SUMMARY OF THE FOURTH MEETING OF THE COORDINATING COMMITTEE

CHARLES RIVER WATERSHED STUDY

15 February 1968

1. The fourth meeting of the Coordinating Committee was held in the Theatre, New England Division, Corps of Engineers, Waltham, Massachusetts. The following members and guests attended this meeting:

2. COORDINATING COMMITTEE MEMBERS OR ALTERNATES

a. Federal Agencies

U. S. Army, Corps of Engineers, Colonel Remi O. Renier, Committee Chairman

U. S. Department of Agriculture, Mr. Karl Klingelhofer, Massachusetts Soil Conservation Engineer

U. S. Department of Health, Education and Welfare, Mr. Floyd B. Taylor, Public Health Service, Program Chief, Water Supply & Sea Resources

U. S. Department of Housing and Urban Development, Mr. Frank A. Batstone, Deputy Director of Planning, Program Coordination and Services Division, Region I

U. S. Department of Interior, Mr. Mark Abelson, Regional Coordinator, Northeast Field Committee

b. State Agencies

Massachusetts Department of Natural Resources, Mr. Malcolm E. Graf, Director and Chief Engineer, Massachusetts Water Resources Commission

Metropolitan District Commission, Mr. Howard Whitmore, Commissioner

Metropolitan Area Planning Council, Mr. John Culp, Director of Planning

3. GUESTS

U. S. Department of Health, Education and Welfare

Mr. Charles Larson, Sanitary Engineer, Public Health Service

U. S. Department of Interior

Mr. C. E. Knox, U. S. Geological Survey

Mr. James W. Lambie, Sanitary Engineer, F.W.P.C.A.

Mr. William J. Butler, Sanitary Engineer, F.W.P.C.A.

Massachusetts Department of Natural Resources

Mr. William A. Slagle, Jr., Civil Engineer, Division of Water Pollution Control

Mr. Alfred F. Ferullo, Env./Biol. Engineer, Division of Water Pollution Control

Mr. W. Leigh Bridges, Biologist, Division of Marine Fisheries

Mr. Clinton E. Watson, Biologist, Division of Marine Fisheries

Metropolitan District Commission

Mr. Charles O. Clark, Director and Chief Engineer, Water Division

Corps of Engineers, New England Division

Mr. John Wm. Leslie, Chief Engineering Division

Mr. Edward L. Hill, Chief, Planning Branch

Mr. Joseph L. Ignazio, Chief, River Basin Studies Section

Mr. John M. Lind, Project Engineer, Charles River Watershed Study

Mr. John Blackwell, Urban Planner, Charles River Watershed Study

Mr. Arthur F. Doyle, Engineer, Charles River Watershed Study

Mr. John J. Caffrey, Engineer, Charles River Watershed Study

Mr. Lewis A. Carter, Recreation Specialist

Mr. Elliot Childs, Chief, Hydrology & Hydraulics Branch

Citizen Advisory Committee

Mrs. Russell Haddleton, Vice Chairman, Dover

Mr. Frank S. Christian, Boston

Mrs. F. Murray Forbes, Boston

Mrs. H. Shippen Goodhue, Wellesley

Mrs. Thomas Murray, Franklin

Mr. Henri Prunaret, Natick

Hon. Leverett Saltonstall, Dover

Mr. Daniel G. Wheeler, Dover

Mr. Charles Whitlock, Cambridge

Mr. Arthur Williams, Legislative Counsel

Mr. Kenneth H. Wood, Westwood

Boston Redevelopment Authority

Mr. Ralph Parton, Urban Designer

Mr. Charles W. Roy, Project Engineer

Mr. V. Michael Weinmayr, Landscape architect

4. PROCEEDINGS

The Coordinating Committee was convened by the Chairman, Colonel Remi O. Renier who introduced the committee members in attendance. The proceedings of this meeting as summarized by Colonel Renier are stated below. The complete texts of the formal presentations are attached as appendices.

STUDY PROGRESS TO DATE

Colonel Renier gave a brief Status Report on the overall study, and followed with the progress of the Department of the Army on the Lower Charles Interim Report. It was pointed out that flooding is a real problem, to be solved, and to do this pumping facilities at the Basin are required.

LOWER CHARLES WATER QUALITIES AND PUBLIC HEALTH

Mr. Taylor of HEW stated that health is more than the absence of illness. Handling and disposal of solid wastes remains a critical unresolved problem. He further discussed restraints, because of water quality problems, on recreation and shellfish harvesting. Encephalities is still an incipient health problem in Boston & environs. Use of the Charles River for recreation is the best use of the resource. Water contact recreation is not feasible in the near future.

Mr. Larson of HEW described Boston Harbor pollution. The harbor waters have high coliform sources. It was stated that over ½ million gallons/day of totally untreated sewage is still being dumped into harbor. Chlorination does not have deleterious effects on sea life and ecology but the amount of chlorination used in sewage treatment may be inadequate and much larger doses are needed to avoid disease in humans from shellfish contamination. He explained what creates the need for restricted areas of shellfish and no harvesting. Oil spills (pollution) creates only a temporary closure of shellfish areas.

LOWER CHARLES POLLUTION INVENTORY HIGHLIGHTS

Mr. Lambie, FWPCA discussed in detail the program this past summer of sampling the Charles River to determine existing levels of water quality and the critical needs for oxygen content controls. He pointed out the data which clearly shows that quality problems increase measurably the farther you go into the lower Basin. He showed the amount of coliform present. Also, he stated that improvements made possible by the MDC efforts to reduce overflows from combined sewers paid real dividends.

CHARLES RIVER POPULATION & URBANIZATION:

Mr. Blackwell pointed out the population densities of the Watershed and of the Lower Charles, and emphasized that densities in the Lower Charles have not changed much over the years. Also, he stated that increasing high-rise construction was adding to this density and centralizing people in the Lower Basin. Growth predictions ranged from 41% to 111% resulting in an average of 50% population growth throughout the Watershed.

LOWER CHARLES RIVER MANAGEMENT:

Mr. John Lind demonstrated that the urgent need is for control of the water level in the Charles Basin and this control is a must if the Muddy River floods are to be restrained. The feasible site for a pumping plant is at the MDC proposed Warren Avenue Dam. He pointed up the need for improved facilities for recreational boating and commercial navigation.

MDC AND THE LOWER CHARLES:

Commissioner Whitmore stated costs for the Warren Avenue dam will range from $22 to $25 million. The dam is badly needed and he feels strongly about that need. He then discussed his equipment and personnel problems at the Deer Island sewage treatment plant.

ASSURING OPEN SPACES IN THE CHARLES RIVER WATERSHED:

Mal Graf, substituting for Mr. Brownell, discussed a need for support of the Wetlands bill now before the legislature and to obtain matching funds to obtain Federal funds under B.O.R. programs. He believes the time is here when we must think of regeneration of sewage plant effluent for return to streams to augment flows.

CHARLES RIVER WATERSHED STUDY
AGENDA
Fourth Coordinating Committee Meeting
Thursday, 15 February 1968
New England Division, Corps of Engineers
424 Trapelo Road, Waltham, Mass.

9:30 AM	Registration
10:00 AM	Study Progress to Date: Colonel Remi O. Renier, Chairman
10:15 AM	Lower Charles Water Qualities and Public Health: Mr. Floyd B. Taylor, Chief, Water Supply Program, also Sea Resources Program, U.S. Dept. H.E.W.
10:35 AM	Lower Charles Pollution Inventory Highlights: Mr. James W. Lambie, U.S. Dept. of Interior, F.W.P.C.A.
10:50 AM	Charles River Population & Urbanization: Mr. John Blackwell, Charles River Study, Corps of Engineers, NED
11:00 AM	Lower Charles River Management: Mr. John M. Lind, Charles River Project Engineer, Corps of Engineers, NED
11:15 AM	MDC and the Lower Charles: Hon. Howard Whitmore, Commissioner, Metropolitan District Commission
11:30 AM	Discussion
12:10 PM	Lunch
12:50 PM	Re-convene
1:00 PM	Assuring Open Spaces in the Charles River Watershed: Mr. Arthur Brownell, Conservation Services Director, Mass. Dept. of Natural Resources
1:20 PM	Further Discussion
2:20 PM	Summary of 15 February Meeting: Col. Renier, Chairman
2:40 PM	Adjournment

APPENDIX B

STATUS REPORT

AS OF 1 JANUARY 1968

CHARLES RIVER STUDY

by

COLONEL REMI O. RENIER

15 February 1968

Coordinating Committee Meeting

Remarks by Colonel Remi O. Renier
Division Engineer, New England Division
U. S. Army Corps of Engineers
To: Charles River Coordinating Committee
Waltham, Mass. 15 February 1968

STATUS REPORT

AS OF 1 JANUARY 1968

CHARLES RIVER STUDY

Status Report:

To report on our general study progress I refer you to the printed Status Report dated 1 January 1968 which was mailed to each of you. To those of you who actually review these charts included in the Report, the bar charts are somewhat misleading when you visually measure our printed percent of actual completion against the length of the scheduled bar spread over many months. Our actual percent of completion reflects quite favorably that the status is on time for the overall study planning. However, because of budget restraints imposed by the latest appropriations we will have to slip total completion into FY-71. We just cannot commit sufficient bodies to the work under our limitations of the dollars available.

In addition to 3 public hearings, 3 Coordinating Committee conferences and 3 Advisory Committee meetings, we have held special conferences in Washington and locally on problems associated with the Charles River Study.

Further, our work effort is reflected in

4 General publications

3 Summaries of conferences

3 Study Status Reports

and, 8 Interim Study memos.

APPENDIX C

PRESENTATION

by

COLONEL REMI O. RENIER

15 February 1968

Coordinating Committee Meeting

Remarks by Colonel Remi O. Renier
Division Engineer, New England Division
U. S. Army Corps of Engineers
To: Charles River Coordinating Committee
Waltham, Mass. 15 February 1968

THE LOWER CHARLES INTERIM REPORT

CORPS OF ENGINEERS EFFORT

I will open with a brief statement on the subject of OPEN SPACE.

This slide shows the whole Eastern Massachusetts Regional Planning Area, the MAPC Area and the Charles River Watershed. We received in November 1967, a preliminary draft of an MAPC Charles River, Mystic River and Neponset River Report, with generalized recommendations on or along the River between Warren Avenue, Boston, and Noon Hill, Medfield. We are awaiting another MAPC Open Space Report with recommendations for Charles River Watershed towns and cities.

Next, I will discuss the Lower Charles Interim Report.

This map of the whole Charles River Watershed is colored to show the Lower Charles section in yellow, on which we are focusing today.

This slide shows the Lower Charles Interim Report area, again in yellow. The area shown in red is the Stony Brook sub-watershed in Waltham, Weston, Lincoln and Lexington. It is just upstream of the Interim Report area. It is the principal source of domestic water for the City of Cambridge. Low flow augmentation of the lower Charles

from this source was considered and not found feasible. We have issued a study memo on this watershed. I should point out that there is another Stony Brook in Boston, which falls within that Lower Basin Interim Report I am discussing.

The next slide shows only the Lower Charles Study Area. The area in pink covers some 56 square miles, along 11.9 river miles of the Charles between Moody Street, Waltham, and Warren Avenue, Boston. In this Lower Charles Interim Report area, we are dealing with the day-time needs of more than 1,250,000 people, and the overnight and weekend needs of 700,000 or more permanent types.

The Charles River Basin, (the water impoundment behind the Charles River Dam) is the principal landscape feature of the Lower Charles Interim Report Study Area now being written, and is its largest, most nearly permanent open space. The Basin is customarily held close to a design pool level about 2.4 feet above mean sea level at Boston. At this level, the Basin has an area of 675 surface acres.

Best known is the wide portion of the Basin, some 2.6 miles long, between Boston University Bridge and Charles River Dam. This view is looking down the Basin from the neighborhood of Boston University Field; this next view is looking up the Basin from the dam and Boston Science Museum toward the Massachusetts Institute of Technology, and Boston University.

Lower Charles Open Space and Recreation, has been inventoried and reported in a recent memo, distributed last month. Further recommendations on this topic will be deferred to the Final Report.

Flood Control and navigation are the principal topics of the Lower Charles Interim Report: also pollution, so far as it becomes involved in the Basin flood control.

For you to fully understand the overall study approach, I wish to review our studies related to flood control and navigation.

After more than 40 years of public discussion (1861-1901), the existing Charles River Dam was completed in June 1910. It was constructed for three purposes:

(1) To eliminate unacceptable tidal marsh conditions along the Charles River

(2) To prevent tidal flooding of low-lying lands in Boston and Cambridge

(3) To create a constant-level pool for aesthetic improvement and for recreation uses.

The Dam was designed to maintain a water level about 2-1/2 feet below mean high tide. The Basin design level has been so well maintained over the years that many hundreds of million dollars worth of buildings in Boston and Cambridge have since been constructed at low elevations, and almost all available marginal lands have become utilized. But, at high tides, the gravity sluices at the dam cannot discharge water from the basin.

In general, basin water level control in a future hurricane or other high runoff period will require pumping in order to discharge water from the Basin to Boston Harbor against the tide.

On week-days, fuel oil is barged through the Basin to an electric generating plant built in 1949 that also has contracts to supply steam to nearby buildings.

On week-ends, the Basin is intensively used by power and sailing and rowing boats and far less frequently by commercial barges. These navigational needs have been evaluated and recommendations are being prepared for the Lower Charles Interim Report.

The Lower Charles flooding problems have been under our study since October 1967. In this study, we have examined MDC proposals for a new dam, fishway, pumping station, navigation locks, highway bridge and sewage conduits at Warren Avenue, Boston.

The MDC proposed Warren Avenue facilities would replace and improve on the existing river-management and navigation facilities, at the sixty-year old Charles River Dam.

Need for improved facilities of some kind was demonstrated by consultants retained by the MDC twelve years ago, following hurricane rainfall "Diane", 19 August 1955. At that time, the Charles River Basin water level rose to some 4-1/2 feet above the 1905 design level, and remained at or near that flood level much of four days. Storrow Drive travelled lanes are constructed 12 to 18 inches above the 1905 design pool level. In 1955 they were under 3 - 3-1/2 feet of water. More serious

consequences of the 1955 flooding were in the Back Bay, Roxbury and Brookline storm drains and sewers, which were flooded by the high basin level. Also, there was flooding of Boston Edison and Cambridge Electric Light Co. manholes, conduits and junction boxes in low-lying terrain, and of New England Telephone and Telegraph Co. manholes, conduits and junction boxes. In addition, there was wetting of basements (and basement contents) in nearly all Cambridge and Boston residential, commercial, industrial, educational and special service buildings in the flood plain of the Charles. This included basement boiler rooms and basement machinery rooms for elevators, for telephone exchanges, and for electric-power fransformation/ distribution within buildings.

There are today unusual damage potentials in basement wettings in MIT buildings, in the Cambridge Electric Light Co. generating station on the Broad Canal, in the Science Museum, the Massachusetts General Hospital buildings, the Boston Public Library, the Fine Arts Museum, Northeastern University, Boston University and all the low-land churches, schools and hospitals.

The MDC consultants found and reported that approximately 89% of the August 1955 Charles River Basin peak level waters came from the lower 12 miles of the Charles, below Moody Street, Waltham.

Very little peak inflow was from farther upstream. The consultants also pointed out the great intensification of runoff due to

building and street-paving in lowland Boston, Brookline, Newton, Waltham, Watertown and Cambridge in the years since 1905.

Storm water concentrations of 1955 were estimated to have begun arriving in the Basin within three to four hours after the start of major rainfall. The existing Leverett Street sluices were designed to operate under conditions when three to four days would be an interval between rainfall start and cumulation of peak waters in the Charles River Basin. Thus, the arrival time of peak inflow waters in 1968 is about 24 times faster than in 1908, when the River Dam was first closed. And due to paving, the inflow rates in 1955 and 1968 are several times larger than they were in 1905 or 1908.

The MDC consultants studied additional sluicing. Because of the great extent and intensification of building and paving, it was found that no amount of additional gravity sluicing could prevent excessive Basin water levels in storms like that of August 1955. Also, it was found that more than doubling the 1905 sluicing capacity would not securely protect the Basin in such a storm as that of September 1954 or of October 1962, except in the most favorable circumstances of low tides directly preceding storm peak inflows to the Basin.

The original designers of the 1905 dam were free to plan to fluctuate the Basin water level some six feet, from 3 feet below to 3 feet above the design level. Now, because of existing urban development it is intolerable to draw the Basin down as much as 1-1/2 feet

below, or to let it rise more than 1-1/2 feet above the design pool level of 1905. Much closer control of Charles River Basin water level has become physically required, not merely desirable. Metropolitan transportation, economic land development and preservation of urban drainage are the dominating requirements that high Charles River Basin water levels be prevented.

Two new transportation facilities built since 1955 add to the requirements for Basin-water level control; the Massachusetts Turnpike and the MBTA Highland Branch trolley transit extension from Kenmore Square.

In the Fens, Boston, the Turnpike crosses the two Stony Brook conduits, the Fens channel and the Muddy River conduit under Brookline Avenue. The MBTA Highland Branch parallels the Muddy River some 3,300 linear feet along the northwesterly bank between Park Drive and Aspinwall Avenue. Water from the October 1962 storm flowed down the subway incline and for a time disrupted all MBTA tunnel services through Kenmore Square underground.

In addition, a new facility, the Inner Belt Expressway, I-695, may traverse the Fens some 3,100 linear feet on or close to Park Drive alignment, crossing the two Stony Brook conduits and in effect damming the Muddy River at Park Drive, some seven hundred (700) feet northwesterly of Brookline Avenue.

At the present time, the flood flow from Stony Brook discharges to the Back Bay Fens, thence to the Charles River through a series of

bridges, conduits and open channel in the Fens. The maximum flood flow reaching the Fens from Stony Brook is limited by the size of the outlet conduit and is about 3,300 cfs. It is understood that the two Stony Brook siphons under the Inner Belt are being designed to maintain present flow conditions. Thus, the flood flow to the Fens of about 3,300 cfs will continue.

We know that a peak flood flow of 2,800 cfs from Muddy River will have to be provided for in constructing the Inner Belt at Park Drive. Current conduits and pipes are insufficient.

One way of handling the Muddy River's 2,800 cfs flood flow would be to construct a siphon under the Inner Belt to assure that 300 to 400 cfs flowed through the existing Brookline Avenue/Deerfield Street conduit to the Charles; the remaining 2,400 cfs into the Fens and so to the Charles. This would barely replace existing facilities. However, with flood flows from Stony Brook (about 3,300 cfs) added in the Fens, the bridge openings, conduits and sections of open channel through the lower Fens are inadequate in cross section to carry those combined flows (upwards of 6,000 cfs) to the Charles. Significant enlargement of those older waterway openings to accommodate the combined flows would require extensive and costly construction.

An alternative solution could be to divert Muddy River flood flows (2,800 cfs) directly to the Charles by a new conduit constructed as part of the Inner Belt highway northwesterly, between Muddy River at Park Drive and the Boston University Bridge.

The Bureau of Public Roads representative in Boston has proposed that Massachusetts DPW explore this alternative plan. Should such a conduit be built as part of the Inner Belt, the flood flows reaching the bridges, conduits and sections of open channel in the lower Fens would be only about 3,300 cfs at most, and rather minor alterations would suffice to pass flood flows expected over the years ahead.

By reason of recent building construction close to the Basin, the Charles River Dam primary function of keeping high tides and storm tides out is now as important (perhaps more important) than its function of keeping fresh water in to cover the former flats. It is noteworthy that the 1955 "Diane" storm water level in the Basin (+6.9 m.s.l.) was barely 5 inches higher than the twice monthly "spring" high tide in Boston Harbor (6.5 m.s.l.), which is kept out by the Dam. Also, it is noteworthy that the 6.9 ft. "Diane" level on the downstream side of the Dam has been equalled or exceeded on more than 700 occasions in the 44 years 1922-1966 according to tidal height observations at the U. S. Appraisers Stores Building in Boston, corner of Northern Avenue and Atlantic Avenue, or an arithmetic average of 16 occasions per year.

This completes my summary on Corps portions of the Lower Charles Interim Report.

Sets of pages, listing some of the principal physical and social facts affecting the Charles River Basin, have been reproduced for distribution at our noon recess.

Now, I present Mr. Floyd B. Taylor, Chief, Water Supply Program, also Sea Resources Program, U. S. Department of Health, Education & Welfare, Boston.

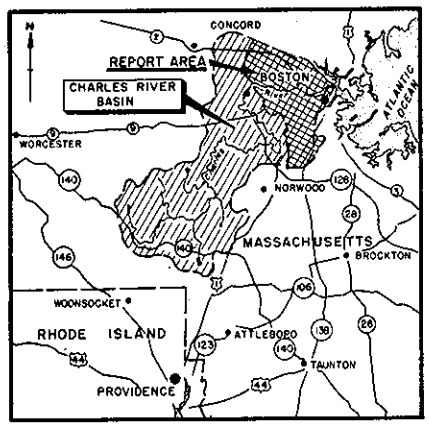
CORPS OF ENGINEERS

U.S. ARMY

MERRIMACK RIVER WATERSHED
(SHAWSHEEN)

LIMIT OF WATERSHED

MYSTIC RIVER WATERSHED



VICINITY MAP
SCALE IN MILES
10 0 10

PROPOSED CHARLES RIVER DAM

LIMIT OF REPORT AREA

MOODY STREET DAM

WATERTOWN DAM

CHARLES RIVER DAM (1910)

STONY BROOK RESERVOIR

HOBBS BROOK RESERVOIR

HARDY POND

CHESTNUT HILL RES.

BROOKLINE RES.

CRYSTAL LAKE

FRESH POND

JAMAICA POND

FRANKLIN PARK

LEXINGTON
ARLINGTON
WALTHAM
BELMONT
CAMBRIDGE
SOMERVILLE
CHARLESTOWN
WATERTOWN
ALLSTON
BRIGHTON
NEWTON
BROOKLINE
WELLESLEY
NEEDHAM
WEST ROXBURY
ROXBURY
BOSTON
SOUTH BOSTON
DORCHESTER
MILTON
DEDHAM
DOVER
WESTWOOD
STONY BROOK RESERVATION

CHARLES RIVER
MYSTIC RIVER
CHARLES RIVER BASIN
BOSTON INNER HARBOR
NEPONSET RIVER
MOTHER BROOK

ROUTE 128
ROUTE 20
ROUTE 9
ROUTE 30
ROUTE 1-S-28
MASSACHUSETTS TURNPIKE
MASS TPK AVE.
COMMONWEALTH AVE.
BEACON STREET
HUNTINGTON AVE.
MASS AVE.
COLUMBUS AVE.
SOUTHEAST EXPRESSWAY
DUDLEY ST.
PERKINS ST.
WEST ROXBURY PARKWAY
CENTER STREET
WASHINGTON STREET
GALLIVAN BLVD
MORTON ST.
BLUE HILL AVE.
DORCHESTER AVE.
COLUMBIA ROAD
GODDARD AVE
WAVERLY ROAD
TRAPELO ROAD
LEXINGTON STREET
HOBBS BROOK
FITZGERALD EXPY
INNER BELT
PROPOSED MASS BASIN
PROPOSED STONY BROOK RESERVOIR
VETERANS OF FOREIGN WARS PARKWAY
CONDUIT STREET
WEST BROOK
EXPRESSWAY

N

2,000' 0 2,000' 4,000' 6000' 8000'

LIMIT OF WATERSHED

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY G.K.D. | CK. BY

SUBMITTED

APPROVAL RECOMMENDED
CHIEF PLANNING BRANCH

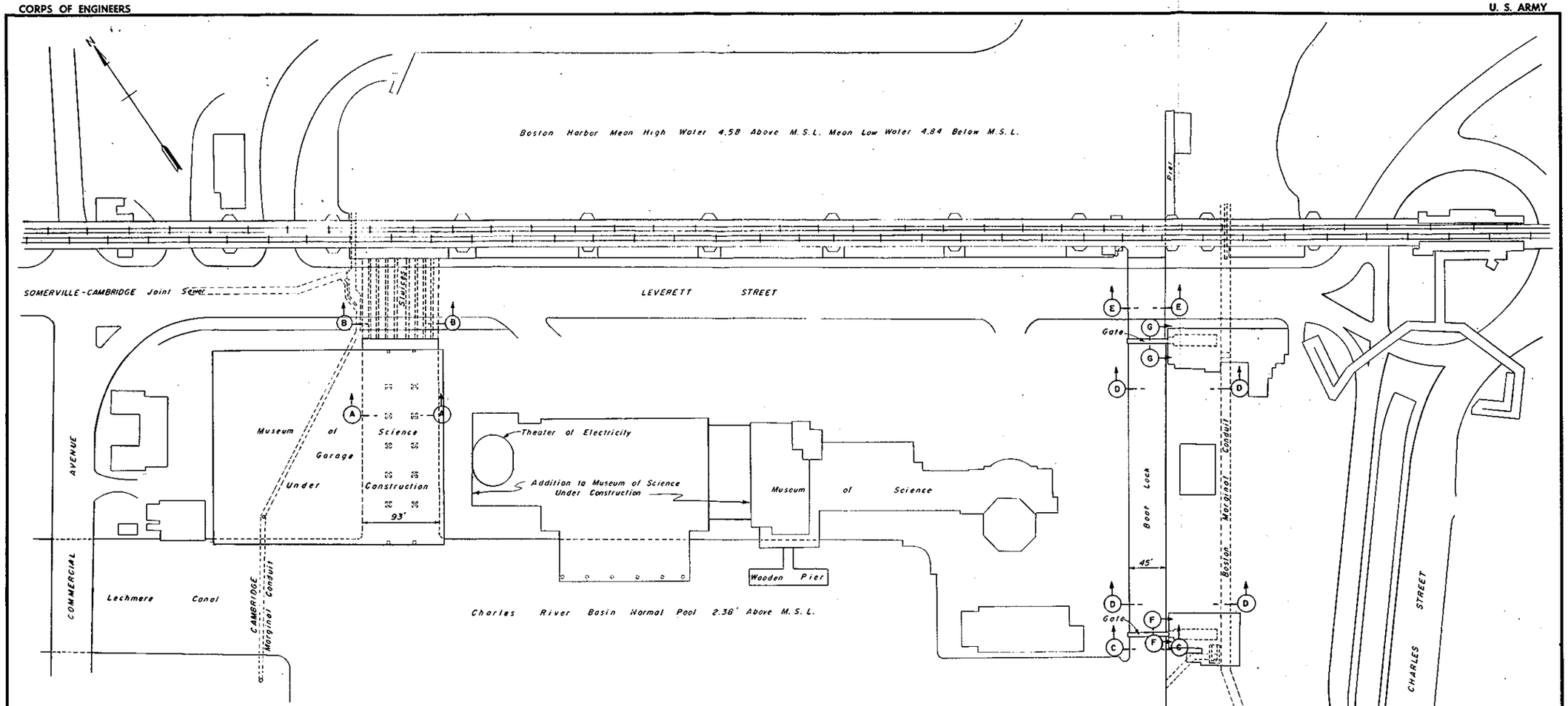
APPROVED
CHIEF ENGINEERING DIVISION
DATE

CHARLES RIVER WATERSHED STUDY
LOWER CHARLES INTERIM REPORT
STUDY AREA
CHARLES RIVER, MASSACHUSETTS

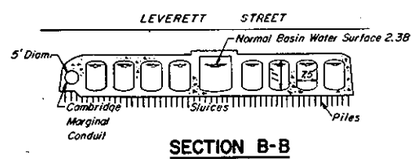
DRAWING NUMBER

SHEET

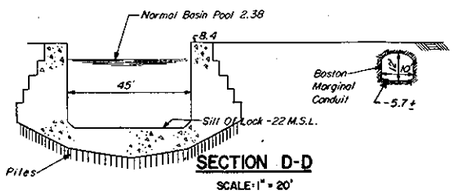
CORPS OF ENGINEERS U. S. ARMY



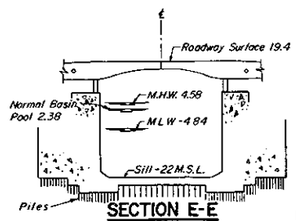
PLAN
SCALE: 1" = 50'



SECTION B-B
SCALE: 1" = 20'

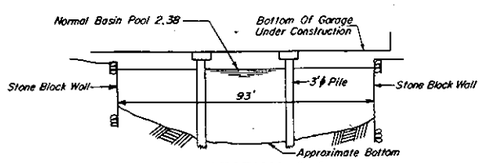


SECTION D-D
SCALE: 1" = 20'



SECTION E-E
LEVERETT STREET LIFT BRIDGE
SCALE: 1" = 20'

NOTES:
Elevations - Mean Sea Level Datum
M.D.C. Datum Is 105.62 Below M.S.L.
Boston City Datum is 5.65 Below M.S.L..



SECTION A-A
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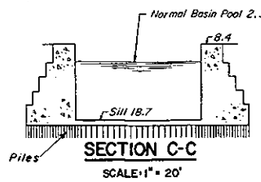
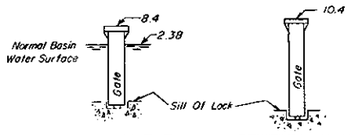


SECTION C-C
SCALE: 1" = 20'



SECTION F-F
UPSTREAM GATE
SCALE: 1" = 20'

SECTION G-G
DOWNSTREAM GATE
SCALE: 1" = 20'

GRAPHIC SCALES
1" = 50' 50' 0 50' 100'
1" = 20' 20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY | CK. BY

SUBMITTED:

CHIEF, PLAN FORMULATION SECT.

APPROVAL RECOMMENDED:

CHIEF, PLANNING BRANCH

CHARLES RIVER WATERSHED STUDY

CHARLES RIVER DAM

PLAN AND SECTIONS

CHARLES RIVER MASSACHUSETTS

APPROVED DATE OCT 1967

CHIEF, ENGINEERING DIVISION

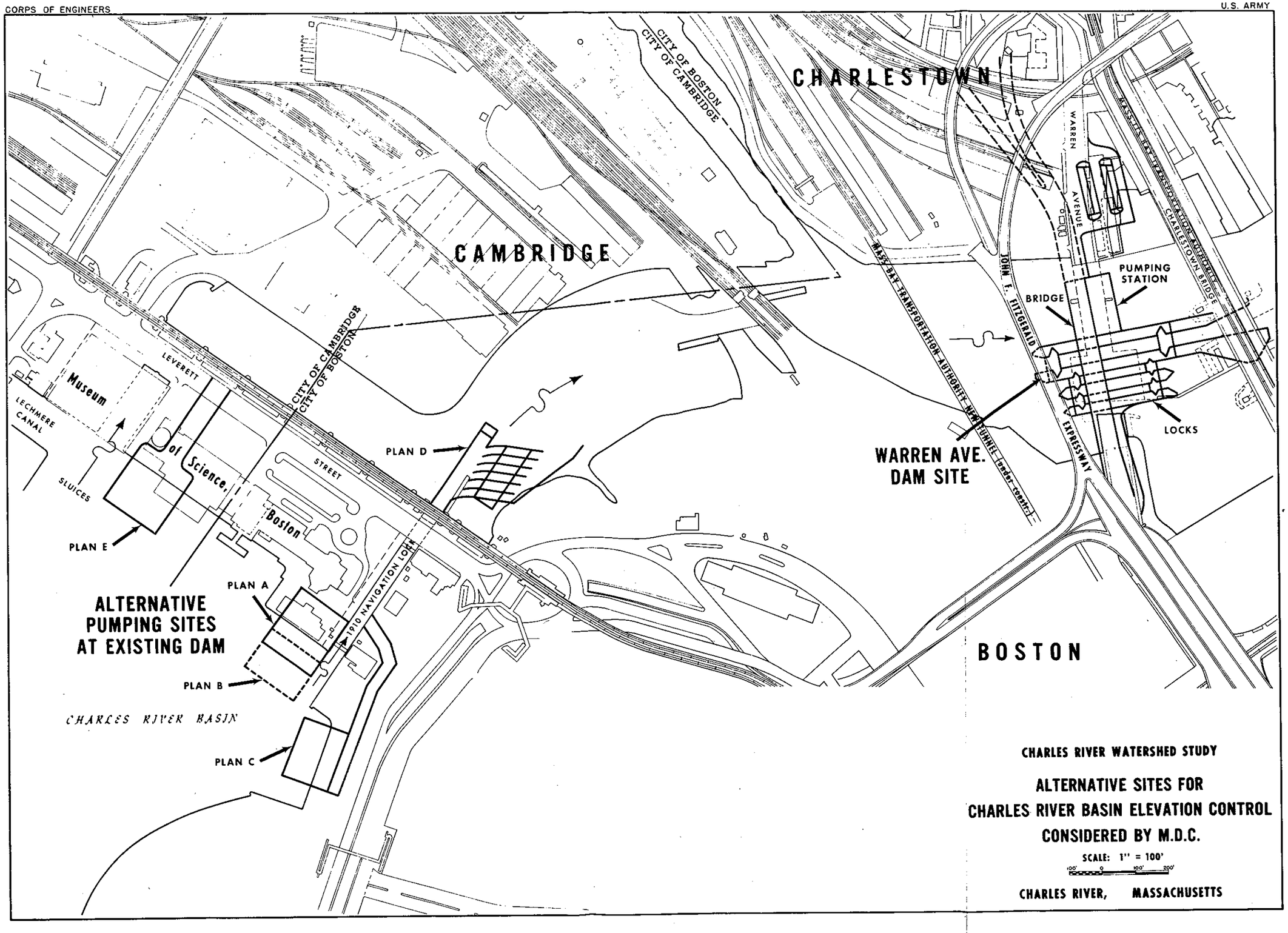
SCALES AS SHOWN

DRAWING NUMBER

SHEET

CORPS OF ENGINEERS

U.S. ARMY



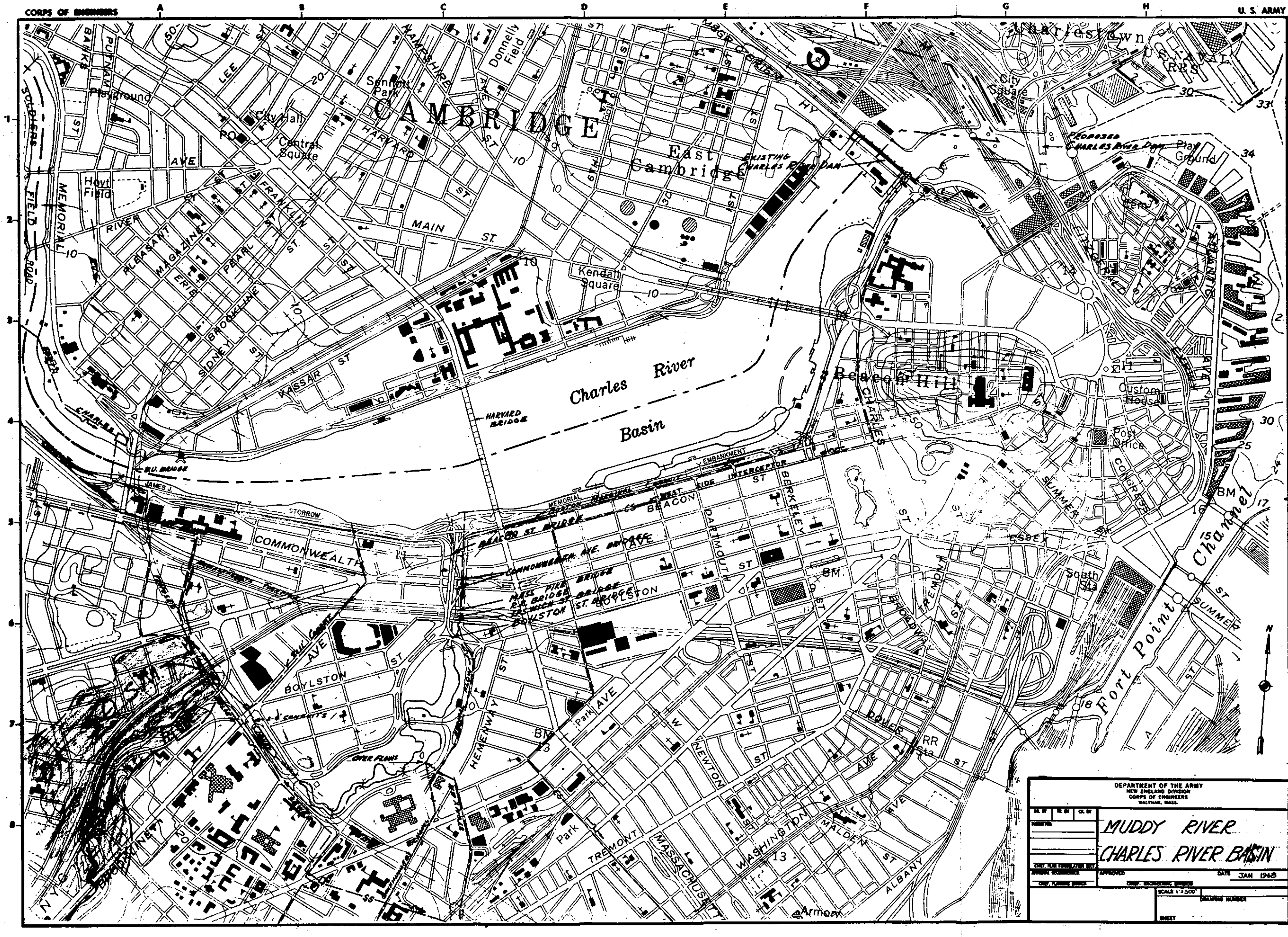
CHARLES RIVER WATERSHED STUDY

ALTERNATIVE SITES FOR CHARLES RIVER BASIN ELEVATION CONTROL CONSIDERED BY M.D.C.

SCALE: 1" = 100'

100' 0 100' 200'

CHARLES RIVER, MASSACHUSETTS



CORPS OF ENGINEERS
U. S. ARMY
CAMBRIDGE
East Cambridge
Charlestown
City Square
Central Square
City Hall
Kendall Square
Hoyt Field
Donnelly Field
Charles River Basin
HARVARD BRIDGE
B.U. BRIDGE
EXISTING CHARLES RIVER DAM
PROPOSED CHARLES RIVER DAM
Beacon Hill
Custom House
Post Office
South Sta
Fort Point Channel
MEMORIAL DRIVE
STORROW
COMMONWEALTH AVE
BEACON ST
BOYLSTON ST
HUNTINGTON AVE
MASSACHUSETTS
TREMONT
WASHINGTON
ALBANY ST
BEACON ST BRIDGE
COMMONWEALTH AVE. BRIDGE
MASS PIKE BRIDGE
BOYLSTON ST. BRIDGE
Armory
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
MUDDY RIVER
CHARLES RIVER BASIN
JAN 1968

APPENDIX D

PRESENTATION

by

FLOYD B. TAYLOR

and

CHARLES LARSON

15 February 1968

Coordinating Committee Meeting

THE LOWER CHARLES RIVER STUDY

WATER QUALITY AND PUBLIC HEALTH

FEBRUARY 15, 1968

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

BUREAU OF DISEASE PREVENTION AND ENVIRONMENTAL CONTROL

National Center for Urban and Industrial Health

Water Supply and Sea Resources Program

Region I

Boston, Massachusetts 02203

THE LOWER CHARLES RIVER STUDY
WATER QUALITY AND PUBLIC HEALTH *

Introduction:

Health, paraphrasing what Surgeon General Stewart said recently, is not only the absence of disease but the presence of a positive, cheerful outlook on life. Furthermore, the physical and mental health of people has been shown to be closely related to their utilization of water resources.

There are seven areas, as follows, of specific health concern with water resources:

1. Provision of adequate and safe public and individual water supply sources.
2. Provision of adequate and healthful water based recreation.
3. Proper solid waste disposal.
4. Protection of shellfish growing areas in estuarine waters from the effects of water pollution.
5. Provision of adequate control of the vectors of disease.
6. Protection of health before and after the use of pesticides in agriculture or for the control of aquatic growths, and
7. Elimination of floods which create gross insanitary conditions, destroy housing, and inundate public and individual water supplies.

While all these have a bearing on the Charles River Basin as a whole, only three or four will be discussed this morning in connection with the assigned topic which pertains only to the Lower Charles River Basin.

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*A paper presented February 15, 1968, at the Fourth Coordinating Committee Meeting, Charles River Watershed Study - N.E. Division Corps of Engineers, Waltham, Massachusetts, by Charles Larson & Floyd Taylor of the U. S. Public Health Service, Boston, Massachusetts.

These are water supply, recreation, and shellfish production. However, before proceeding with the discussion of these topics, I would like to comment briefly on the matters of vector control and solid waste disposal.

In public health terms, a vector is an insect or animal, which can or may transmit a communicable disease from an infected person to a well person or from an animal reservoir of the disease to a well person. Of concern in New England is the vector of Eastern encephalitis of which New England is considered the "home". Early records of the 19th century indicate the presence of this disease and later research has shown that its two mosquito vectors are quite commonly found in New England. These vectors are the salt marsh mosquito, Aedes sollicitans, and the fresh water vector, Aedes vexans. Of the 148 Eastern encephalitis cases on record, 50 occurred in the State of Massachusetts and 14 of these took place during the flood years of 1955 - 56. It is perhaps somewhat paradoxical that the water quality of the lower part of the Charles River Basin would mitigate against the breeding of the vector because of the presence of the large amount of oil and other chemical wastes. However, in a flood year without adequate control of floods, it is possible that the mosquito vector of encephalitis could breed in flood waters of the Lower Charles.

The proper disposal of solid wastes is essential to preservation of water resources. The problem is a national one and many water supply sources have been contaminated from improper disposal of wastes in low areas. Detailed information is not at hand on waste disposal along the Lower Charles River.

Public Water Supply

Use of the Lower Charles River for public water supply purposes is considered unlikely because of the poor quality, low quantity (at times) and availability of alternative sources. For example, the water in the Lower Charles is high in coliform organisms and organic material and often contains high amounts of salt water. The latter requires complex and costly treatment processes for removal, and even to deal with the average poor quality of the Lower Charles River water would require sophisticated water treatment processes. It has been reported that there are periods when there is virtually no flow coming out of the Lower Charles and this would contraindicate its usefulness as a dependable source of water supply. A third point is that the entire urban area adjoining the Lower Charles watershed is served its drinking water by the Metropolitan District Commission. According to some data, demands on the MDC system now average about 227 million gallons per day and there is an estimated safe yield at present of 335 million gallons per day. This would provide the capacity to meet increasing demands for some time to come and there are plans for augmenting the MDC supply so that its safe yield will increase in future years. These considerations lead to the conclusion that turning to the Lower Charles for public water source would probably not be the method of choice. Also under current State Law (GLC 111, Paragraph 160) a public water supply source may not be utilized for recreation of any type or waste disposal. Since these two are the primary uses of the Lower Charles, there is this further deterrent to utilizing it as a source of water supply.

Recreation

At present the Lower Charles River is used for non-body contact recreation, namely, boating. The attached graph/ plate no. 1 utilizing data provided by courtesy of the Water Pollution Control Administration, illustrates the bacterial quality of the Lower Charles from Moody Street Bridge to its mouth. The solid lines crossing the graph represent the recommendations of the indicated agencies concerning the bacterial content of water for both body contact recreation as well as general recreation, including boating. It will be noted that the present bacteriological quality of the Lower Charles precludes its use for body contact recreation, such as swimming or water skiing, as at no time during the sampling period did its quality meet either the recommendations of the U. S. Public Health Service (as provided to the Technical Advisory Committee) or of the State of Massachusetts. It will be noted also that the recommendations of the Public Health Service for general recreation were not met at the second sampling spot, namely, at John Weeks Foot Bridge, and there is, therefore, some question as to whether even this form of recreation at present is safe.

There have been several reports to Public Health Service officials by crew members and coxswains of crews that following unavoidable exposure to the water of the Lower Charles, they developed rashes and other manifestations of skin infection. This could be attributed to either bacterial infection or chemical irritation.

There are other areas along the Charles River which presently meet the requirements for body contact recreation but these are upstream from the area under consideration, and in order to receive full utilization would need improvement of the River banks, beach construction, and other measures. The presence of numerous storm water overflows, some of which are combined sewers, create a hazardous situation for bathers and limit the desirability of the River even for non-body contact recreational use of the Lower Charles.

Shellfish in Boston Harbor

plate no. 2

Making an assessment of the contribution of the Charles River to the pollution of Boston Harbor is a difficult task because the larger sources, such as Deer Island Sewage Treatment Plant, tend to mask the contribution of the River. There is no doubt that the Charles River is contributing to the pollution of Boston Harbor and this conclusion is substantiated by the Federal Water Pollution Control Administration data collected in August and September 1967, at the Longfellow Bridge. At this location the median total coliform MPN was 16,000/100 ml and the median fecal coliform MPN was 900/100 ml. These bacterial densities are much greater than those accepted for "approved" or "restricted" shellfish growing areas. Part I of the National Shellfish Sanitation Program Manual of Operations gives the criteria for the classification of shellfish growing areas and states that "approved" areas should have a median total coliform MPN of 70/100 ml with no more than 10% of the samples exceeding an MPN of 230/100 ml and that the samples should be collected in those portions of the areas most probably exposed to fecal material during the most unfavorable hydrographic and pollution conditions. A "restricted"

area must have a median total coliform MPN of 700/100 ml and no more than 10% of the samples greater than 2300/100 ml, and all shellfish harvested from these areas must be treated at a depuration plant.

Last summer, following completion of part of the Public Health Service's annual evaluation of the Massachusetts Shellfish Sanitation Program, the bacteriological quality of the softshell clams coming from the Newburyport Shellfish Treatment plant was questioned. As part of the investigation that followed, the "restricted" areas within Boston Harbor were examined to determine if they were properly classified. The major sources of pollution at that time were as follows:

> Deer Island Sewage Treatment Plant - this plant is presently receiving 300 - 350 MGD (of which about 100 MGD is sea water intrusion) and providing no treatment, although chlorination is due to begin soon.
>
> Nut Island Sewage Treatment Plant - this plant is presently providing primary treatment for 80 MGD of sewage flow, but does not chlorinate during the winter.
>
> Moon Island Sewage Treatment Plant - this plant has been closed although about 0.5 MGD of raw sewage is still discharged. This situation should be corrected within 18 months.

As a result of these surveys six of the existing 29 restricted areas were closed resulting in the removal of 757 acres of shellfish growing waters from production. This brings the total acreage closed to 2,317 and using "landed values" of shellfish in Massachusetts the potential worth of this closed acreage is estimated to be $93,000 with a total ultimate value to the economy of about ten (10) times this or $930,000. (Annually).

It should also be stated that there are 1,538 acres of restricted areas (although 4 areas totaling 232 acres have been closed temporarily because of an oil spill in the Weymouth Fore River) and 500 acres of "approved" areas remaining within Boston Harbor. These areas are being reviewed and evaluated.

If the treatment plants do begin to operate properly with adequate chlorination (adequate means more than 0.5 to 1.0 mg/l residual after fifteen minutes detention time, and that the dosage along with the contact time will be sufficient to inactivate viruses), and sources of pollution such as the Charles River continue to discharge to the Harbor it is doubtful that the shellfish beds can be reopened.

Conclusions

In conclusion, the basic use of the Lower Charles is non-body contact recreation but even this is subject to some question, in light of the evidence discussed above. Certainly steps should be taken to improve the quality of the Lower Charles River by eliminating combined sewers, industrial waste discharges, either into the storm water systems or illegally constructed

industrial outfalls, and eliminating the oil and scum which is so apparent. Making these improvements would create a Lower Charles River more aesthetically pleasing and would create an increase in the desirability of its use, both as a boating area as well as an area along which citizens of the Boston region could enjoy outings. Furthermore elimination of this pollution would help toward restoration of Boston Harbor shellfish growing areas.

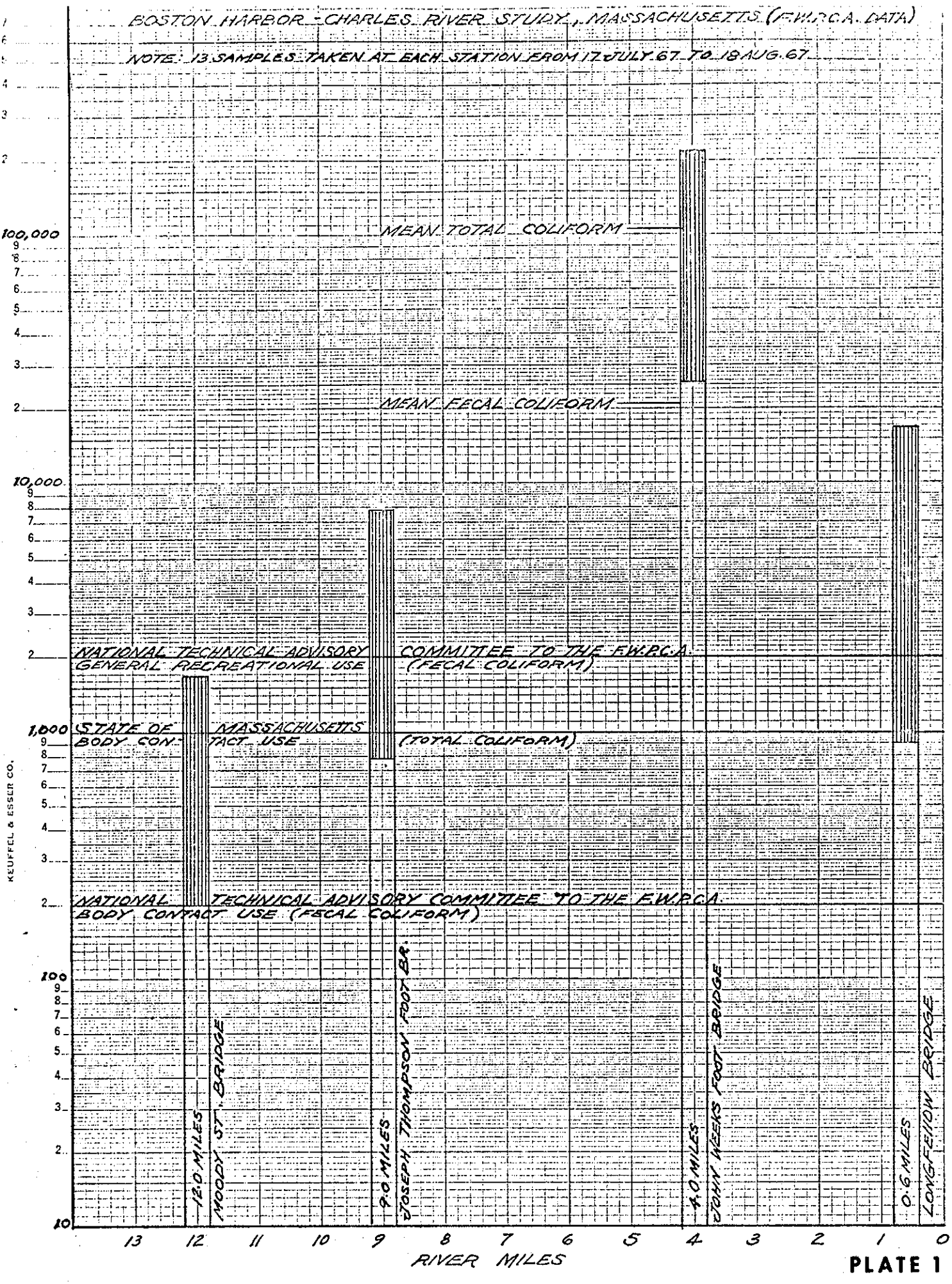
BOSTON HARBOR - CHARLES RIVER STUDY, MASSACHUSETTS (F.W.P.C.A. DATA)
NOTE: 13 SAMPLES TAKEN AT EACH STATION FROM 17 JULY 67 TO 18 AUG. 67
MEAN TOTAL COLIFORM
MEAN FECAL COLIFORM
NATIONAL TECHNICAL ADVISORY COMMITTEE TO THE F.W.P.C.A. (FECAL COLIFORM)
GENERAL RECREATIONAL USE
STATE OF MASSACHUSETTS BODY CONTACT USE
(TOTAL COLIFORM)
NATIONAL TECHNICAL ADVISORY COMMITTEE TO THE F.W.P.C.A.
BODY CONTACT USE (FECAL COLIFORM)
12.0 MILES MOODY ST. BRIDGE
9.0 MILES JOSEPH THOMPSON FOOT BR.
4.0 MILES JOHN WEEKS FOOT BRIDGE
0.6 MILES LONGFELLOW BRIDGE
100,000
10,000
1,000
100
10
RIVER MILES
KEUFFEL & ESSER CO.

PLATE 1

BOSTON HARBOR - CHARLES RIVER STUDY

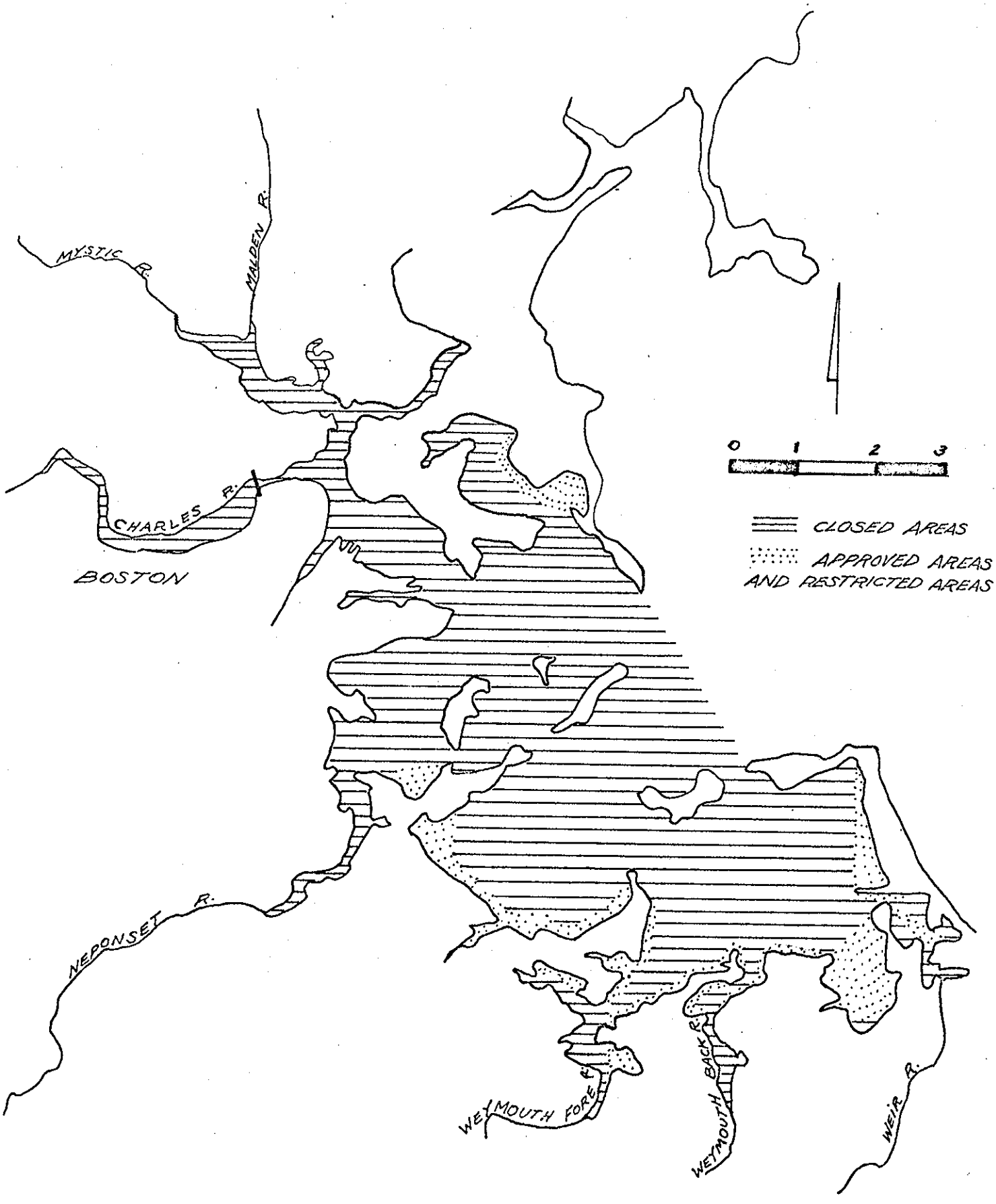

PLATE 2

APPENDIX E

PRESENTATION

by

JAMES W. LAMBIE

15 February 1968

Coordinating Committee Meeting

CHARLES RIVER WATERSHED STUDY

LOWER CHARLES RIVER POLLUTION

Fourth Coordinating Committee Meeting

February 15, 1968

At the most recent Coordinating Committee Meeting we mentioned that a water quality evaluation program of the Charles and Boston Harbor was conducted last summer. The work was carried out by representatives of our office, a group from the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio; and was conducted as a joint effort with the Metropolitan District Commission and the Massachusetts Division of Water Pollution Control.

This morning I will cover some of the study results as they relate to the lower basin of the Charles River.

The location of the sampling stations are shown on Plate 1. In all, there were 17 stations in the watershed, three of which are in the lower basin--C-17 at Longfellow Bridge, C-16 at the John Weeks footbridge, and C-15 at the Tompson footbridge above Watertown Square. C-14 is at the Moody Street Bridge and provides an indication of the water quality just before it reaches the lower basin.

Each station was sampled 13 times between July 14 and August 18. Samples were taken a foot or two below the surface, and were analyzed for numerous chemical, physical, bacteriological and biological characteristics.

One of the most commonly used indicators of pollution is BOD, or biochemical oxygen demand. Organic matter in water goes through a natural decomposition process which requires or demands oxygen; and consequently decreases the dissolved oxygen contained in the water. The amount of this demand for oxygen is measured as BOD or biochemical oxygen demand. It serves as an indication of both the amount of decaying organic material in the water as well as the rate at which oxygen will be drawn from the water.

Plate 2 shows the average BOD in milligrams per liter at each station. The horizontal line indicates that decomposing leaves and other natural materials exert a normal background BOD level which is present in all streams regardless of man-made pollution. The rising trend beginning at river mile 27 shows an increasing concentration of waste in the river as it approaches the lower basin, the last three stations or bars on the right side of the graph being in the basin. The drop at the last station, Longfellow Bridge, shows the effect of the decomposition process and also reflects the fact suspended solids settle to the bottom of the basin, therefore, reducing the oxygen demand near the surface.

Another important parameter is the dissolved oxygen level itself. The level at any point is a function of the oxygen demand, and the natural reaeration process whereby oxygen from the atmosphere is transferred to the water. If the demand is greater than the reaeration rate, the dissolved oxygen level will drop; if the reaeration rate exceeds the rate of oxygen demand, the level will increase.

Plate 3 shows the average dissolved oxygen levels in milligrams per liter and the minimum levels measured at each station. The blue line is at 5 milligrams per liter and serves as a reference. This is a generally accepted minimum necessary to maintain a good fish habitat. The definite downward trend in levels through the basin reflects the rising BOD or oxygen demand we have just seen on the previous graph.

Generally speaking the results of the BOD and dissolved oxygen tests show a substantial waste load is transmitted to the basin. Some comes from upstream sources, with a build-up starting at about mile 27 or Station C-10, and more is contributed directly to the basin from combined overflows. The net effect is to depress or lower dissolved oxygen levels as the water moves through the basin. The very slow movement of water through the basin also allows sludge to settle to the bottom where it decomposes in an anaerolic or sceptic condition, that is without oxygen.

A third commonly used indicator is the number of coliform bacteria detected in the samples. Coliform bacteria are a group of several different kinds of bacteria, usually of intestinal origin, that can be detected by a specific standard test. They are counted as organisms per 100 milliliters of sample. The presence of coliform bacteria does not prove the presence of disease causing, or pathogenic, bacteria; but it does indicate the possibility exists. This possibility is increased when fecal coliform bacteria are also known to be present.

Plate 4 shows the average total coliforms and the average fecal coliforms measured in the basin. The horizontal line at 1000 indicates the maximum acceptable if the waters are to be used for swimming. Noting that the vertical scale is logaithmic, it can be seen that fairly high averages were encountered in the basin. An individual high for the test period of 6.5 million total, and 1.2 million fecal, occurred at the Weeks Bridge in August 17th. Coliform amounth also varied widely from day to day showing the erratic influence of overflows from combined sewer systems in the basin area.

I might also say that the one specific test made in the basin for Salmonella, which is a pathogenic organism, was positive. This is certain proof of water contamination by a disease-producing organism, and a further indication of serious pollution in the basin.

The M. D. C. is in the midst of a program to reduce overflow from combined sewer systems to the basin. As part of this program, a new relief sewer has been constructed along the south bank of the Charles and was placed in operation last summer.

In an attempt to measure the effect of the new sewer, coliform data collected before activation, and coliform data collected after activation, are compared on plate 5. The first column shows the geometric mean of samples collected in June, July and August and the second column is derived from samples collected in September, October and November. The influence in the upper position appears to be quite marked, while in the lower basin, contamination from other sources overrides or masks the effect.

The data also strongly indicates that, although there has been a major improvement, sources of pollution still remain. This was further verified by spot checks for fecal coliform on December 12 and 13 at thirteen stations between Watertown Dam and Eliot Bridge.

The M. D. C. is in the process of checking connections and regulating structures that are a part of their system. It would appear, however, that in spite of these and other corrective measures that are presently planned, effluent from other non-M. D. C. systems, effluent from illegal sanitary connections to storm sewers, and pollutants contained in storm drainage and urban runoff are still going to be a problem which must be recognized and considered in our future planning.

The results of last summer's program are presented in detail in a report which covers the quality of both Boston Harbor and the Charles River. It covers a great many more aspects, including a biological analysis of the river, and provides more detail than I have been able to this morning. Copies of this report have been provided to the Corps, the Massachusetts Division of Water Pollution Control, the M. D. C. and the Charles River Watershed Association.

The next step in our overall study will be to combine this water quality data gathered last summer with information on rainfall, stream flow and waste loads to construct a mathematical model of the river. Once established, this model can then be used to forecast future water quality in the river under varying waste load and flow conditions. It will provide a means to test the feasibility of alternate control measures, including low flow augmentation, that will be required to improve the water quality management of the river.

Thank you very much for your attention.

LOCATION MAP

Boston Harbor-Charles River Study
Massachusetts

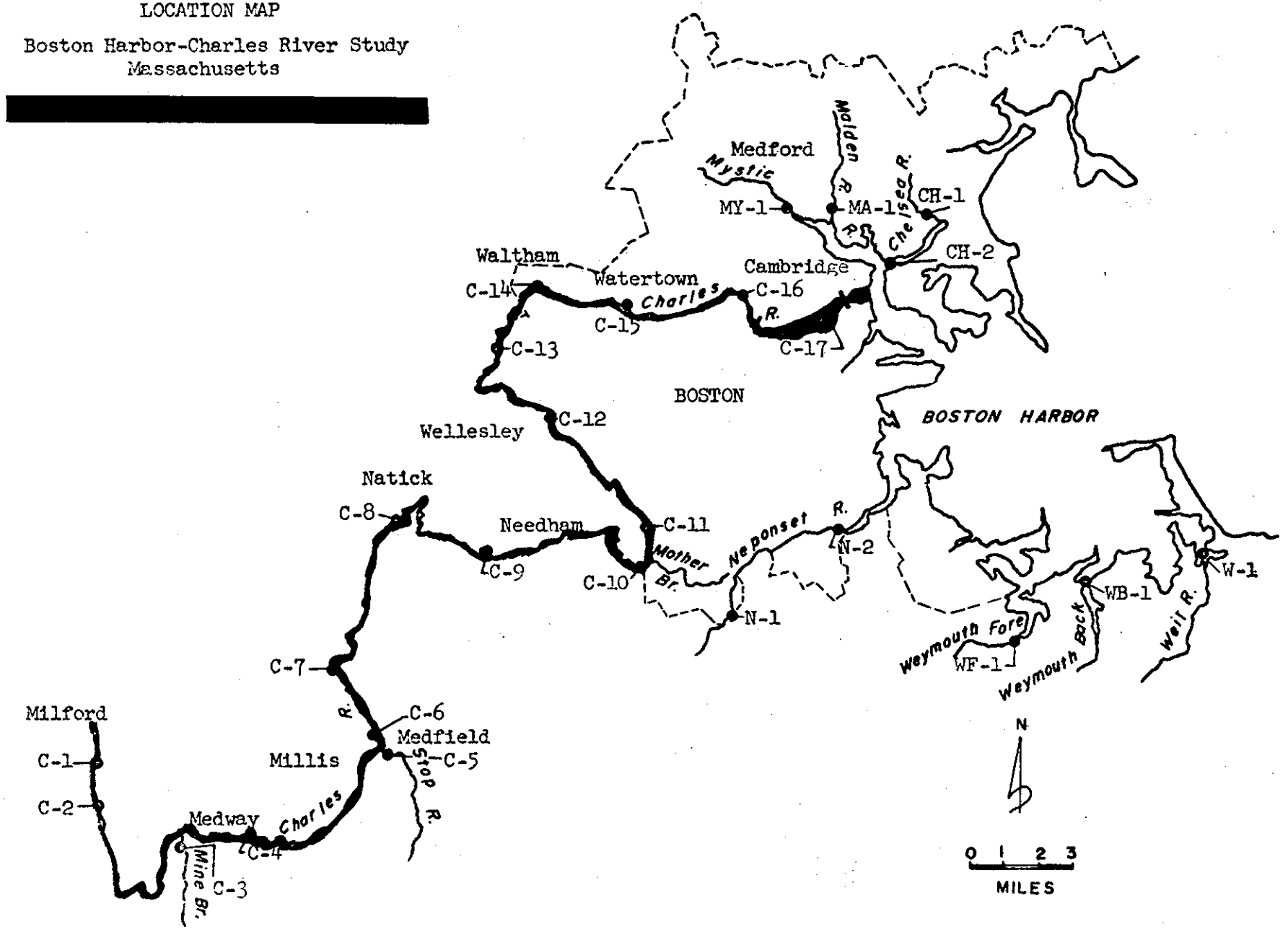

PLATE 1

BIOCHEMICAL OXYGEN DEMAND (B.O.D.)

Boston Harbor-Charles River Study
Massachusetts

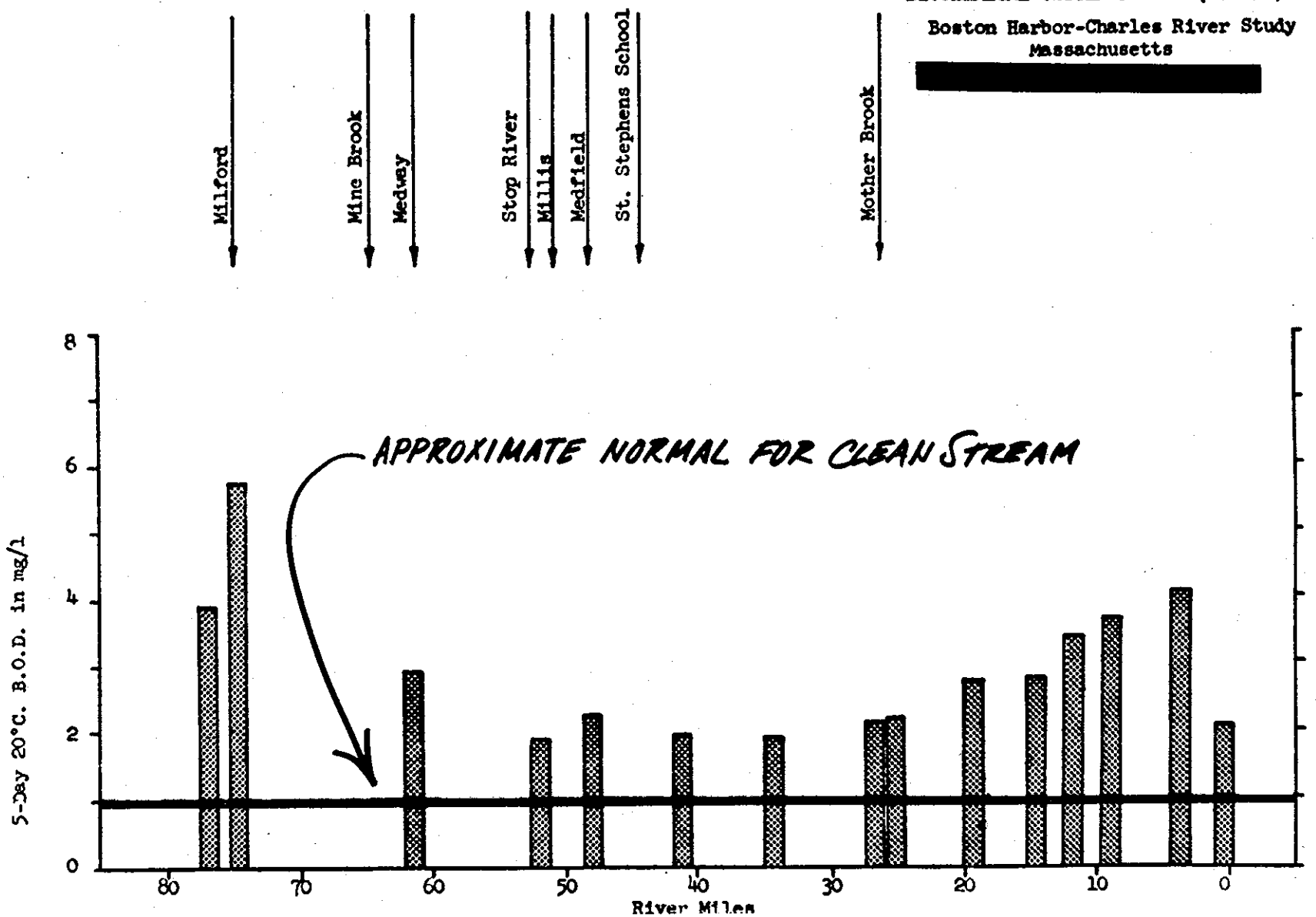

PLATE 2

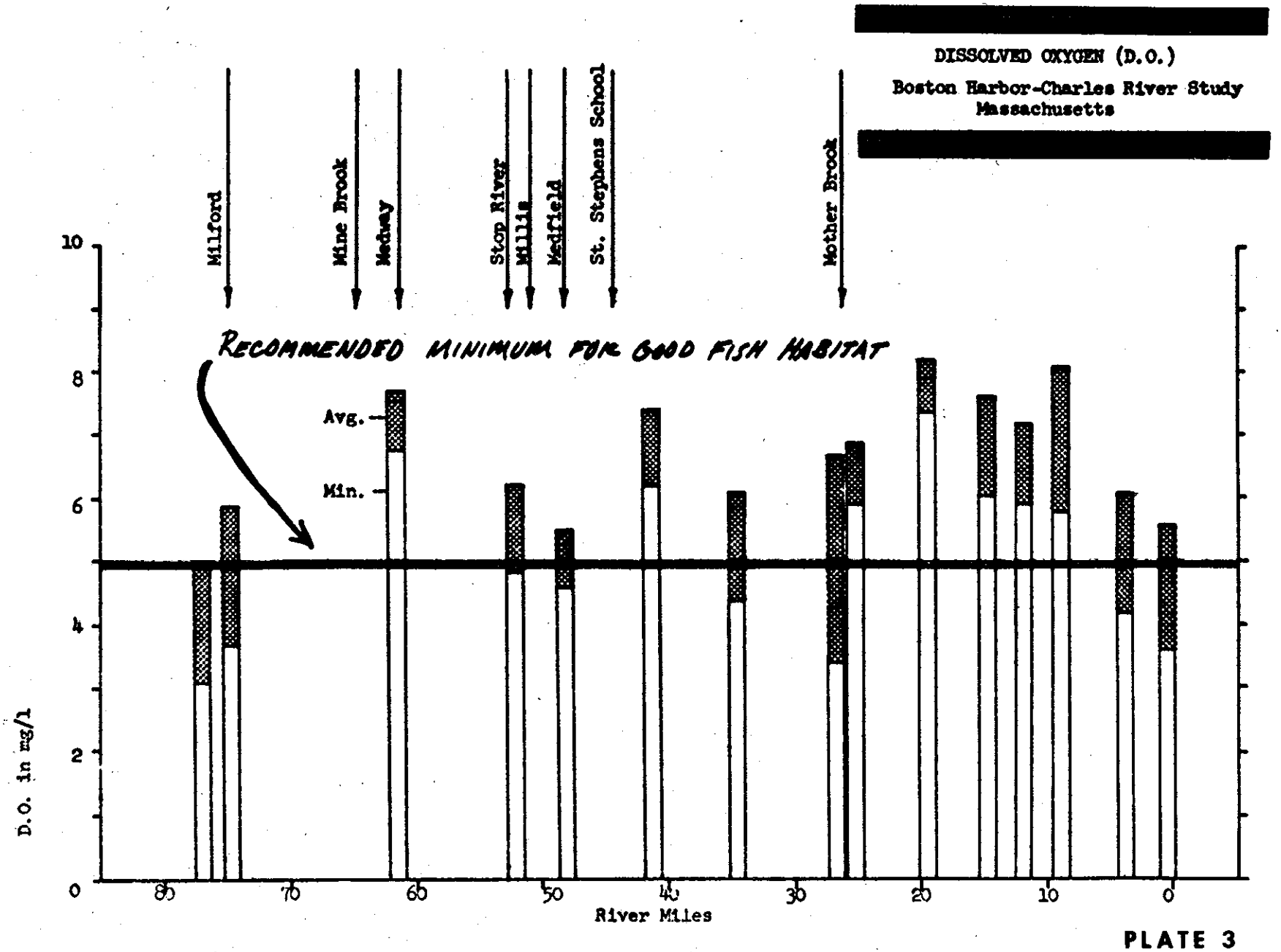
DISSOLVED OXYGEN (D.O.)
Boston Harbor-Charles River Study
Massachusetts
Milford
Mine Brook
Medway
Stop River
Millis
Medfield
St. Stephens School
Mother Brook
RECOMMENDED MINIMUM FOR GOOD FISH HABITAT
Avg.
Min.
D.O. in mg/l
0
2
4
6
8
10
80
70
60
50
40
30
20
10
0
River Miles

PLATE 3

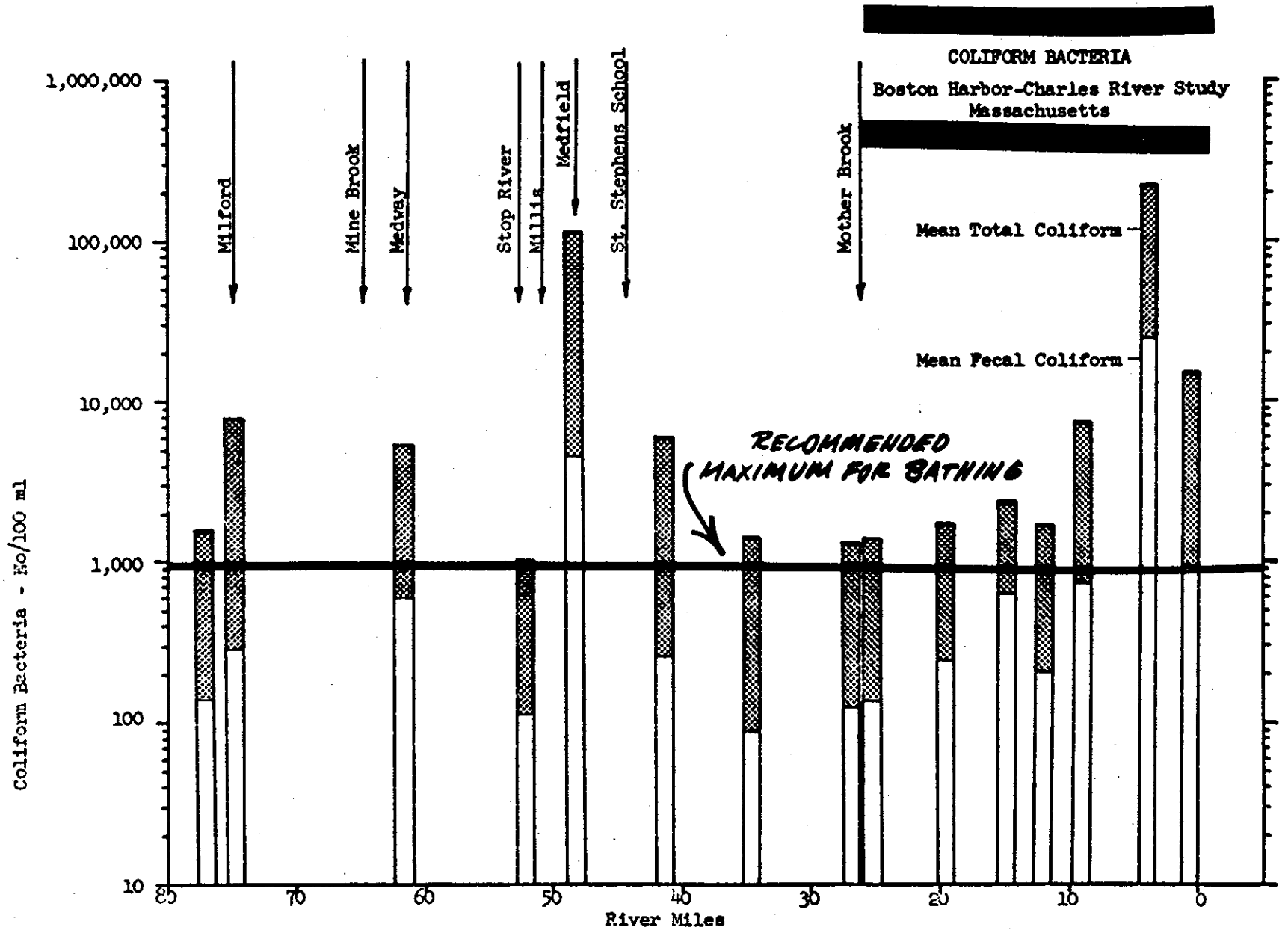
COLIFORM BACTERIA
Boston Harbor-Charles River Study
Massachusetts
Mean Total Coliform
Mean Fecal Coliform
RECOMMENDED MAXIMUM FOR BATHING
Milford
Mine Brook
Medway
Stop River
Millis
Medfield
St. Stephens School
Mother Brook
1,000,000
100,000
10,000
1,000
100
10
Coliform Bacteria - Mo/100 ml
85
70
60
50
40
30
20
10
0
River Miles

PLATE 4

CHARLES RIVER BASIN

– Effect of Activation of South Charles Relief Sewer on the Water Quality

LOCATION	BEFORE ACTIVATION[1] (Coliform Org/100 ml)	AFTER ACTIVATION[2] (Coliform Org/100 ml)
Watertown Dam	22,400	2,400
N. Beacon St. Br.	40,800	7,100
Eliot Br.	84,600	20,200
Western Ave. Br.[3]	53,300	20,200
B. U. Br.[3]	54,700	73,500

1. Geometric mean of three samples collected June, July, and Aug., 1967
2. Geometric mean of three samples collected Sept., Oct., and Nov., 1967
3. Influenced by overflows from the Cambridge Branch Sewer

PLATE 5

APPENDIX F

PRESENTATION

by

JOHN BLACKWELL

15 February 1968

Coordinating Committee Meeting

Remarks by John Blackwell
Urban Planner, Charles River Study
U.S. Army, Corps of Engineers, New England Division
TO: Charles River Coordinating Committee
Waltham, Mass., 15 February 1968

COORD. COMM. 15 Feb. 68

Lower Charles Population and Urbanization

The Lower Charles Report Area, downstream of Moody Street, Waltham, contains the most densely urban portions of the Charles River Watershed. Nearly six hundred thousand people -- about two-thirds of all Watershed residents -- live in the Lower Charles. And week-days, a million or more additional persons surge into this area for work, school, business, health, shopping or entertainment, according to the Eastern Massachusetts regional traffic survey. That summarizes the current numbers of Lower Charles occupants, both resident and transient.

High intensity urbanization has long marked the Charles. Four-sixths of all Charles residents are living in about one-sixth of the Watershed. A century ago, nearly four-fifths of Watershed residents lived in this same small Lower Charles Area. And two centuries ago, in 1765, about four-sixths were living in the Lower Charles.

For the future, continuing concentration in the Lower Charles appears likely.

Federal, State and Municipal taxation policies, together with great fixed public and private investments in parks, water supply, sewerage, motorways, transit, and major institutions have established a framework for individual private developments of the future.

New apartments, office buildings, classrooms and dormitories are being built in the Lower Charles. M.I.T. buildings, B.U. buildings and the Prudential Center are large recent examples. Now an even taller John Hancock building is proposed.

Other examples of new major apartment buildings and office or classroom buildings are spread all 'round the Boston and Cambridge shores of the Charles Basin and throughout the Lower Charles Area. Looking from the Science Museum upstream there are new apartments at Charles River Park, on Beacon Street and elsewhere both on the Boston and on the Cambridge sides of the River. A new multi-story Middlesex County office building is coming in East Cambridge. The Town of Watertown desires taxable re-use of Watertown Arsenal property. Farther upstream on the Lower Charles there have been additional new buildings and groups of buildings with parking areas. Taken together, these developments demonstrate a likelihood of continuing population concentration in the Lower Charles Study Area. On that assumption, a trial forecast to the year 2,000 could be constructed as follows:

1) A U. S. National population of 200,000,000 was declared by the U. S. Department of Commerce in November 1967, and was said to be about 70% urban.

2) A 300,000,000 population by the year 2000 has been widely forecast, expected to be about 80% urban.

3) The Charles Watershed population in 1965 was about 850,000 people, about 90% urban and sub-urban.

4) It is presumed the Watershed growth will parallel the national urban growth through the next thirty-three years.

5) If so, a straight-line projection to the year 2000 of the Charles Watershed 1965 population by existing major geographic segments, could result as follows:

Segment	Year 1965	Pop'n Growth	Year 2000	1965-2000 Population Increase
Lower Charles (Warren Av, Boston-Moody Street, Waltham)	590,000	260,000	850,000	44%
Mid-Charles (Moody St, Waltham-South Natick Dam)	177,000	73,000	250,000	41%
Upper Charles (So. Natick Dam - Echo Lake & Headwaters)	83,000	92,000	175,000	111%
	850,000		1,275,000	

The overall result is a 50% increase in Watershed total population with two-thirds of the total still living in the Lower Charles. This is the same relative distribution and concentration as today.

Whatever the specific numbers, it may be responsibly speculated that about two-thirds of the future residents of the Charles Watershed will continue to live in the Lower Charles Report Area. This speculation is influenced by the massive metropolitan physical facilities available in the area.

Many Lower Charles institutions are of national or of regional character and significance. Such institutions will not soon be duplicated, nor be re-located elsewhere than the Lower Charles. So far as they are the work-places of local residents, these primary economic institutions and all related secondary and tertiary activities will continue to draw and hold large numbers of persons in the existing stock of acceptable dwellings nearby. Federally-aided urban renewal in portions of Boston, Brookline,

Cambridge, Newton, Watertown and Waltham will either replace or enhance portions of that existing dwelling stock.

Barring national catastrophe, there appears every reason to expect continuing concentration of residents and of week-day commuters in the Lower Charles Report area. The prospect of such continuing concentration has several consequences for our Lower Charles Interim Report on flood control and navigation.

First, floods of the future, equalling Charles Basin water levels of August 1955, would likely cause greater loss, damage, disruption and inconvenience now than in 1955 because of further concentration of buildings and transportation facilities in the Basin lowlands in the past fourteen years.

Second, the physical bulk of buildings in the lowlands close to the Basin is increasing and the occupancy is changing from residential (formerly) toward institutional and commercial, with continued residential. These and other land-use changes are inducing changes in navigation requirements in the Basin. Heavy fuel oil is barged to the Cambridge Electric Light Company plant at a significant saving in delivery cost per barrel compared to trucking. And one barge load would require 55 tank truck trips to carry it, we found. Also, large-dimension radar and magnet laboratory heavy units have been barged in to M.I.T. rather than being trucked in.

Third, the demand for recreation uses of the Charles River Basin water-surface and related open river-bank or river-view lands will rise with the rising buildings and rising population.

Thus, it appears likely that in future there will be <u>increasing</u> justification for State and Federal interest in Charles flood control, navigation and pollution reduction facilities.

APPENDIX G

PRESENTATION

by

JOHN M. LIND

15 February 1968

Coordinating Committee Meeting

Remarks by John M. Lind
Project Engineer, Charles River Study
New England Division
U. S. Army Corps of Engineers
To: Charles River Coordinating Committee
Waltham, Mass. 15 February 1968

LOWER CHARLES

FLOOD CONTROL

AND NAVIGATION STUDIES

Col. Renier has described the general characteristics of the Lower Charles River area. He covered the present flood problem in the Charles River Basin area and in Muddy River, and mentioned that the Interim Report which will be confined to the lower watershed, will contain specific recommendations only for flood control and navigation.

The primary flood problem in the Lower Charles is lack of Basin level control. No satisfactory solution of the Muddy River problem is possible without first controlling the basin water level. Discharge of flood flows from Muddy River requires maintaining a near normal Basin level.

The main portion of the existing Charles River dam is a wide earth section with a top elevation 15 feet above mean sea level. Most of this section of the dam, about 7 acres, is now occupied by the Museum of Science. Upon completion of a current construction program, the investment in Museum buildings will be about $15 million.

At the northerly end of the dam, 8 sluice gates provide the only means of basin level control. Water may be discharged to Boston Harbor only when the tide is low.

At the southerly end of the dam, a 45 foot wide lock permits the passage of commercial and recreational boats between the Basin and Boston Harbor. The lock is equipped with two gates which move horizontally into place from slots in the southerly wall of the lock. These gates by present day standards are obsolete and inadequate.

- - - - - - - - - - - - - - - -

After the record flood in August 1955, consulting engineers for the Metropolitan District Commission studied the flood problem. Early consideration was given to constructing a pumping station at the existing dam to control the Basin level. Six alternative locations were studied. None were found feasible.

In 1959, a plan was developed for a new dam, 2200 feet downstream of the present dam. The site is at the abandoned Warren Avenue highway bridge between Boston and Charlestown. This is the project that the MDC now proposes for solution of the flood problem and to afford improved navigation.

The principal features of this multiple-purpose project are a pumping station and three navigation locks - one sized to accommodate commercial vessels. Additional features include a fish ladder and a highway viaduct between Boston and Charlestown.

Upon construction of the new dam, the lock and sluice gates at the existing dam would be removed. The basin would then extend 2200 feet downstream of the existing dam.

We have reviewed the detailed studies and reports by the MDC consultants, and have considered other alternatives. Our cost and project studies are now nearly completed. The new dam and facilities proposed at Warren Avenue, appear effective and practical.

Flooding has been experienced in the Charles River Basin on many occasions. It must be assumed that past levels of flooding will be repeated in the future, unless the Basin level is controlled by pumping.

A field survey of economic losses from flooding is now under way. About 40% of the flooded area has been surveyed. Figures available indicate that a recurring 1955 flood would cause losses of $1 million in this portion of the flooded area. When all flood loss figures are available, they will be converted to annual benefits and balanced against the annual costs of construction and operation of the proposed dam.

Growth in recreational boating in the Basin is evident. To meet future demands, improved locking facilities will be required. Final benefit information is being prepared relative to improved locking facilities. At the present time, there are some 800 power, sail and rowing boats in the Basin. Preliminary analysis indicates that annual navigation benefits from improved locking at the proposed new dam over the next 50 years would run between 2 to $300,000 annually.

In arriving at recommendations in respect to Federal participation in a project, determinations are made of the project costs and project benefits. The degree of Federal participation which may be anticipated is dependent on the nature of the improvements. Costs assessable to commercial navigation improvements are usually borne entirely by the Federal Government. Costs assessable to recreational boating are usually shared equally by the Federal and local governments. The major construction costs for flood control are usually borne by the Federal Government. However, several of the project costs such as real estate, relocation of utilities and annual maintenance and operations may be borne by non-Federal governmental agencies.

The Interim Report on the Lower Charles will discuss more fully the foregoing items. It will also contain recommendations relative to Federal participation in improvements for flood control and navigation in the Lower Charles River.